

Notes on the Hawaiian Bees of the Genus *Megachile* (Hymenoptera).

BY P. H. TIMBERLAKE.

The discovery of a fifth species of *Megachile* on Oahu brings up the question of the endemicity of these bees. Dr. Perkins in the Introduction to the Fauna Hawaiiensis (Vol. I, part 6, p. lxxxiii, 1913) considers that the three species then known were probably all introduced, two of these, *Megachile palmarum* Perkins, and *M. schauinslandi* Alfken, being in fact at that time recent immigrants. A little later as recorded in a footnote on p. lxxxiii, he states that *palmarum* was known to him from California and *schauinslandi* from China. Meade-Waldo (Ann. and Mag. Nat. Hist. (8), 10, p. 464, 1912) also records a male *Megachile* from Dehra Dun, India, which had been determined previously by Dr. Perkins as *schauinslandi*.*

Megachile diligens Smith, and *timberlakei* Cockerell, have never been taken elsewhere, but this surely is no proof of their endemicity and they will probably be identified from other parts of the world sooner or later.

* Since the above statement was written, a note by Dr. Cockerell has been seen (Ann. and Mag. Nat. Hist. (9), 2, p. 388, 1918), in which the synonymy of *M. schauinslandi* with *M. umbripennis* Smith is mentioned, based on a determination by Friese in which Cockerell concurs. *M. umbripennis* was described from the northern part of India and has been recorded from Nepal, Sikkim and Tenasserim. It is said to have a narrow, fulvous marginal fringe on the second and third tergites of the abdomen, usually much obliterated, especially on the third segment; and a short, white marginal fringe on the sides of the fourth and fifth tergites. Local specimens of *schauinslandi* have a short, pale fulvous, marginal fringe on the sides of the second tergite; similar, but white, fringes on the third and fourth tergites, and a complete narrow, white fringe across the apical margin of the fifth tergite. As Hawaiian specimens show no variation in these characters, I am disposed to accord the difference considerable weight, although they may finally prove to be only sub-specific. It seems probable that our species was introduced from China rather than from India, and until it can be shown that there is intergradation in the above characters it would be better to consider *schauinslandi* distinct.

The latest introduction of these bees turns out to be *Megachile fullawayi*, which Dr. Cockerell described from Guam as late as 1914, but it is likely that the species was brought by commerce to these islands from some other part of the Oriental region, as our communications with Guam are not extensive.

The conclusion that all of our *Megachile* are immigrant species is therefore supported by the fact that three of the five species have been found elsewhere.

TABLE OF HAWAIIAN MEGACHILE.

Females	5
Males	1
1. Front coxae armed with a distinct strong spine.....	2
Front coxae with a very small or rudimentary spine; pubescence short, fulvous on thorax above and on the first tergite of abdomen.	
	<i>M. schauinslandi</i> Alfken
2. Basitarsus of front legs simple.....	3
Basitarsus of front legs with a deep longitudinal furrow beneath; abdomen with dorsal and ventral apical hair-bands pale to rather deep ochreous.....	
	<i>M. fullawayi</i> Cockerell
3. Basitarsus of front legs narrow or not more than twice as wide as the apical joint of the tarsus.....	4
Basitarsus of front legs about three times as wide as the apical joint of the tarsus, its apex truncate and only slightly oblique; pubescence on abdomen deep fulvous.....	
	<i>M. diligens</i> Smith
4. Front tarsi comparatively thick, the basal joint triquetrous, flattened above, the apex truncate and then produced at the anterior corner into a point overlapping the second joint, its ventro-anterior surface covered with dense semi-erect reddish hair on either side but leaving a central, narrow longitudinal bare line; thorax with erect, not very long, pubescence above, mostly white or pale yellowish, but intermixed with brown or blackish hairs on the disk of the mesoscutum; apical keel of the 6th tergite of abdomen deeply emarginate.....	
	<i>M. palmarum</i> Perkins
Front tarsi slender, the basal joint more nearly cylindrical, the ventro-anterior surface without a bare streak, its apex nearly as in <i>palmarum</i> , but less strongly produced; thorax with short erect pubescence, pale ochreous to rather distinctly yellowish in color, and with short appressed scale-like hairs on the mesoscutum, especially towards its anterior and posterior margins; apical keel of the 6th tergite of abdomen weakly emarginate.	
	<i>M. timberlakei</i> Cockerell

5. Thorax above and basal tergite of abdomen with whitish to ochreous pubescence, sometimes with dark hair intermixed on the thorax; ventral scopa comparatively dense..... 6

Thorax above and basal tergite of abdomen with dense, mostly short and appressed pubescence of a deep, bright fulvous color; ventral scopa thin.....*M. schauinslandi* Alfken

6. Venter of abdomen without white apical hair-bands..... 7
Venter with narrow white apical hair-bands beneath and distinct from the scopa..... 8

7. Ventral scopa bright fulvous in color; pubescence on thorax ochreous, becoming griseous on the sides of the mesoscutum; abdomen with narrow, fulvous apical hair-bands on tergites 2 to 5.

M. diligens Smith

Ventral scopa very pale fulvous to pale ochreous; pubescence on disk of thorax sparse, short and erect, whitish on the sides, but much intermixed with blackish hairs medially, the disk also with very fine, pale appressed hairs; abdomen with narrow, white apical hair-bands on tergites 2 to 5 and an apical white fringe on the first tergite.....*M. palmarum* Perkins

8. Ventral scopa rather bright fulvous changing anteriorly to creamy white on the second ventrite; pubescence of face and thorax white, on the disk of the mesoscutum sparse and short with some brownish hairs intermixed, and also a few appressed white scale-like hairs anteriorly on the mesoscutum and along the anterior and posterior margins of the scutellum; abdomen with narrow, white apical hair-bands on the first five tergites.

M. fullawayi Cockerell

Ventral scopa creamy white to pale ochreous; pubescence of face and thorax ochreous or in part yellowish, the disk of the mesoscutum in perfect specimens almost concealed by short, appressed scale-like ochreous hair, with longer, erect and brownish hairs intermixed, first five tergites of abdomen with narrow, apical hair-bands pale ochreous to creamy white, the last band generally whiter than those preceding.....*M. timberlakei* Cockerell

Megachile schauinslandi Alfken.

Alfken, Entom. Nachr., 24, p. 340, 1898.

An abundant species, and may be seen in large numbers visiting the flowers of the Mexican creeper, *Antigonon leptopus*, and less frequently the flower of *Bidens pilosa*, *Citrus* and prob-

ably other plants. It builds its cells of resinous material and is sometimes a nuisance because of its fondness of choosing a keyhole for its nesting site, but doubtlessly other crevices about buildings, walls or fences are utilized. It probably occurs on all the islands and I have seen specimens from Kauai, Oahu, Maui and Hawaii. As before stated, it is also known from China and India.

***Megachile diligens* Smith.**

Smith, Journ. Linn. Soc. Zool., 14, p. 684, 1879.

This species was first collected by Blackburn in Honolulu and has never been found in other parts of the world. Perkins records it from Oahu, Molokai and Kona, Hawaii, and I have seen specimens from Kauai (Koebele); Kaena Point (Giffard) and Waimanalo (Swezey) on Oahu; Kahuku, Hilea and Honuapo, Kau district (Giffard), Kaawaloa, Kealakekua (Giffard) and Napoopoo (Giffard, Swezey), Kona district on Hawaii. It has become comparatively rare in recent years, as remarked by Perkins, and its nesting habits remain largely unknown. According to Blackburn, it forms its nest of leaves of a species of *Acacia* (presumably *Cassia* was meant) rolled up into cylindrical cells, which are joined one at the end of another.

***Megachile palmarum* Perkins.**

Perkins, Fauna Hawaiiensis, vol. I, part 1, p. 114, 1899.

This species was recorded by Perkins indefinitely from several islands, but was certainly taken by him on Oahu. I have seen specimens from the following localities: Kauai (Koebele); Kaimuki (Swezey, Timberlake), Aiea, Pearl Harbor, Oahu Sugar Co. Plantation (Swezey), South Waianae Mts. (Williams), Oahu; and Puunene, Maui (Swezey). It is also recorded by Perkins from California.

It may be found visiting the flowers of *Antigonon leptopus*, although greatly outnumbered during the last few years in Honolulu by *schauinslandi* and *timberlakei*. It builds its nest in the creases of the under surface of palm leaves and probably

in other similar places. The cells are arranged several together end to end, each being cylindrical in shape, bluntly rounded at the basal and concave at the opposite end, from which issuance takes place. They fit so loosely together that they may be readily broken apart without causing material damage, but are nevertheless neatly fashioned, the leaf-segments closely worked into place. The apical end is sometimes formed of a separate circular segment of about the same diameter as the cell. In size the cells are about 6 or 7 by 9 to 13 mm. The larva, on completing its growth, lines the cell with a dark brown layer of silk.

Megachile timberlakei Cockerell.

Cockerell, Canad. Entom. 52, p. 119, 1920.

This species was taken in Honolulu as early as July, 1904 (Terry), and it is probable that Perkins confused it with *palmarum*, as his description of the scopa of the latter species applies much better to *tiberlakei*. It has been collected as follows: on the coast of Kauai (Giffard); Makua (Swezey, Giffard, Timberlake), Kahala (Giffard), Honolulu, including Kaimuki and Waikiki (Terry, Swezey, Timberlake, Bridwell and Williams), Ewa Coral Plain (Swezey) and Makapuu Head (Williams) on Oahu; Lahaina (Timberlake) and Puunene (Swezey) on Maui; Maunalei, Lanai (Giffard) and Kawaihae, Hawaii (Swezey). The bees visit the flowers of *Antigonon leptopus*, *Bidens pilosa* and presumably other flowers. If I remember rightly they were found at Makua, visiting the flowers of the littoral species of sandalwood (*Santalum littorale*). During the summer months the females are frequently seen on windows in houses, and this unusual habit for a bee is explained by their fondness of nesting about houses. *M. schauinslandi* is also often found on windows, and its presence there may be explained in the same way.

The nests of *tiberlakei* are found in crevices about houses and consist of long strings of cells attached end to end and so firmly joined by the overlapping leaf-segments that they do not readily come apart but form a continuous cylinder. These cylinders present rather a ragged appearance, as the outer leaf-

segments are loosely attached at one end and flare out to a more or less degree, so that the structure on the whole is less neat and compact than in *palmarum*. The partition between the cells is formed out of much larger leaf-segments than in the latter species, and these segments are worked to a greater degree into the side walls of the cells. In size each cell is about 8 or 9 mm. long and 7 mm. in diameter. The pupal cocoon in this species is dull brownish on the outside and darker, shining or almost black within.

***Megachile fullawayi* Cockerell.**

Cockerell, Ann. and Mag. Nat. Hist. (8), 14, p. 2, 1914.

This species, which was described from Guam, was first taken here December 14, 1919, in Makiki Valley (Williams) and thus practically within the city limits of Honolulu. It has been collected further as follows: Manoa Valley, January 1, 1920 (Williams); Makapuu Head, January 25, 1920 (Williams); Mokapu Point, August 29, 1920 (Swezey), and Manoa Valley, January, 1921 (Ehrhorn), all these localities being on the southeastern end of Oahu. The bees were found by Mr. Swezey at the flowers of *Scaevola koenigii*, and by Mr. Ehrhorn at those of *Antigonon leptopus*. Further observations on the habits of this bee have not been made.

This bee agrees perfectly with Dr. Cockerell's description, but as the peculiar front tarsi of the male were not mentioned, I sent a male specimen to the U. S. National Museum and requested Mr. Rohwer to compare it with the type of *fullawayi*. Mr. Rohwer promptly complied with my request and wrote that: "The type *fullawayi* has the pubescence yellower and denser; the dentation of the apical segment deeper, more pronounced and with narrower teeth; has the pubescence on the fifth tergite longer and denser; has the broad, inner tooth of the right mandible oblique, wider and with a faint sulcus which makes a slight apical indentation above the middle (in your specimen the tooth of the right mandible is narrower, truncate and without a sulcus). Otherwise I do not note any characters and if the material which you have before you shows any variation it might be well to hesitate before describing it as new. The

type of *fullawayi* has the mandibles partly closed and it is impossible to examine the left mandible. In both specimens the first tergite conceals the posterior face of the propodeum, but I do not think there are any differences to be found on the sclerite. There is no difference in the basal joint of the anterior tarsus in the two specimens."

As the material so far accumulated shows considerable variation in the male, especially as to the color of the pubescence and dentation of the apical segment, and to a less degree in respect to the mandibles and the hair on the fifth tergite, I have no hesitation in regarding the identity of the local material with *fullawayi* as fully established.

Description of a New Species of *Ootetrastichus* from Formosa (Hymen., Chalcid.).

BY P. H. TIMBERLAKE.

In February, 1916, Mr. F. Muir brought with him from Formosa to Honolulu some midribs of sugar cane leaves from which at least two species of *Ootetrastichus* were reared. One of these which was obtained in considerable numbers was placed in breeding cages and also liberated directly in the sugar cane fields of Oahu, but apparently did not reproduce under either condition, and certainly not in the breeding cages. Of the second species about twenty females and a few males were obtained and these were placed in breeding cages. Contrary to the results with the first species, this one, which is described below as *O. formosanus*, immediately began to reproduce on the eggs of *Perkinsiella saccharicida*, and the first generation at Honolulu amounted to about 78 males and 11 females; the second to about 93 males and 109 females; and the third generation to about 512 males and 536 females. After this the generations were inextricably confused and the species was bred in large numbers for distribution on the sugar cane plantations of Kauai, Oahu, Maui and Hawaii. The work was continued throughout 1916 and 1917 and at